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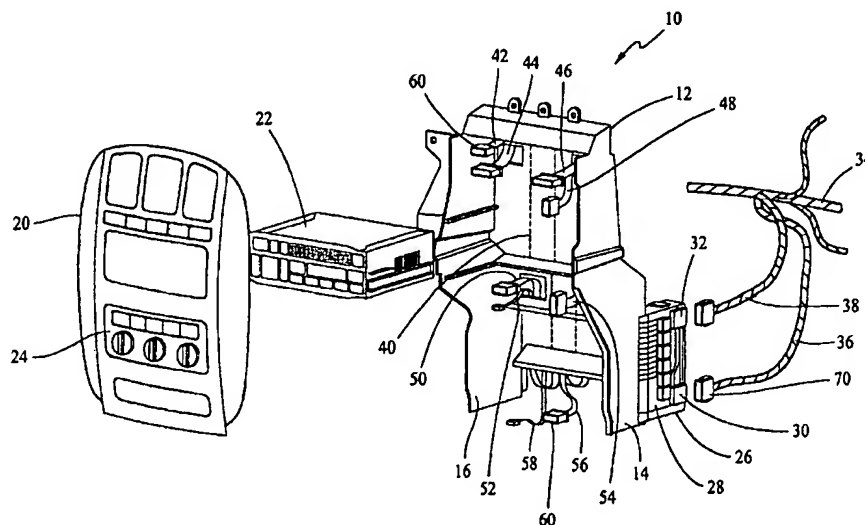
(43) International Publication Date  
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number  
**WO 03/063300 A1**

- (51) International Patent Classification<sup>7</sup>: **H01R 11/30**
- (21) International Application Number: **PCT/US02/01159**
- (22) International Filing Date: 16 January 2002 (16.01.2002)
- (25) Filing Language: English
- (26) Publication Language: English
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**  
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INSTRUMENT PANEL CENTER STACK WITH INTEGRATED WIRING



(57) Abstract: A center stack (10) for an instrument panel assembly includes a thermoplastic housing (12) having at least one wall (14, 16, 18). At least one conductor assembly (40) is molded into at least one wall of the housing.

## INSTRUMENT PANEL CENTER STACK WITH INTEGRATED WIRING

### BACKGROUND OF THE INVENTION

[0001] This invention relates generally to vehicle instrument panel assemblies, and more particularly to instrument panel center stack assemblies with integral conductor assemblies.

[0002] Known instrument panel assemblies include a beam structure and at least one decorative instrument panel attached to the beam structure. Some of the decorative panels act as knee bolsters to protect the vehicle occupants in the event of an impact. An instrument panel assembly is mounted inside the passenger compartment of an automobile with the beam structure attached to the automobile body, typically to the A-pillar. Known instrument panel beam structures are fabricated from steel, aluminum, magnesium, or plastic.

[0003] In addition, known instrument panel assemblies include a center stack which is typically attached to the beam structure. The center stack is sized and shaped to hold various vehicle systems and controls, for example heating and air conditioning controls, a radio, and a CD changer. These systems and controls require electrical power to operate and need to be connected to the main instrument panel wiring harness. Typically, a junction box is connected to the main wiring harness and mounted inside the instrument panel assembly. Separate wire harnesses connect the junction box to the electrical components of the center stack. This configuration of center stack electrical component connections requires numerous parts and extended labor time for assembly.

### BRIEF DESCRIPTION OF THE INVENTION

[0004] In one aspect, a center stack for an automobile instrument panel assembly is provided. The center stack includes a thermoplastic housing having

at least one wall. At least one conductor assembly is molded into at least one wall of the housing.

[0005] In another aspect, a center stack for an automobile instrument panel assembly is provided that includes a housing comprising at least one wall. A junction box housing is molded into one of the walls of the housing.

[0006] In another aspect, a method of producing a center stack for an instrument panel is provided. The center stack includes a housing having at least one wall. The method includes providing a mold, positioning at least one conductor assembly at least partially in the mold, and charging the mold with thermoplastic material to mold the center stack.

[0007] In another aspect, an automobile instrument panel center stack kit is provided. The kit includes a molded thermoplastic housing having at least one wall and a junction box housing molded into one of the walls of the housing. The kit also includes a connector board sized to fit in the junction box housing.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 is an exploded view of an instrument panel center stack in accordance with an embodiment of the present invention.

[0009] Figure 2 is an exploded view of the junction box shown in Figure 1.

[0010] Figure 3 is a schematic section representation of the junction box shown in Figure 1.

[0011] Figure 4 is a rear perspective view of a center stack housing in accordance with another embodiment of the present invention.

[0012] Figure 5 is a schematic perspective view of a center stack housing mold.

[0013] Figure 6 is a cross section view of the mold shown in Figure 5 in an open position.

[0014] Figure 7 is a cross section view of the mold shown in Figure 5 in a closed position.

#### DETAILED DESCRIPTION OF THE INVENTION

[0015] An instrument panel center stack assembly that includes a thermoplastic housing with integrally molded-in conductor assemblies is described below in detail. Molded-in conductor assemblies reduce the amount of wiring and parts in the center stack assembly, and reduce assembly time and weight.

[0016] The thermoplastic center stack housing can be molded from one of many thermoplastic materials. Suitable thermoplastic materials include, but are not limited to, acrylonitrile-butadiene-styrene (ABS), polycarbonate, polycarbonate/ABS blend, a copolycarbonate-polyester, acrylic-styrene-acrylonitrile (ASA), acrylonitrile-(ethylene-polypropylene diamine modified)-styrene (AES), phenylene ether resins, glass filled blends of polyphenylene oxide and polystyrene, blends of polyphenylene ether/polyamide (NORYL GTX® from General Electric Company), blends of polycarbonate/PET/PBT, polybutylene terephthalate and impact modifier (XENOY® resin from General Electric Company), polyamides, phenylene sulfide resins, polyvinyl chloride PVC, high impact polystyrene (HIPS), low/high density polyethylene, polypropylene and thermoplastic olefins (TPO).

[0017] Referring to the drawings, Figure 1 is an exploded view of an instrument panel center stack assembly 10 in accordance with an exemplary embodiment of the present invention. Center stack 10 includes a thermoplastic center stack housing 12 having side walls 14 and 16, and a rear wall 18. A center stack bezel 20 attaches to housing 12. Center stack housing 12 is sized and shaped to receive various vehicle systems and controls, such as, audio system 22 and heating and air conditioning controls 24. A junction box 26 is coupled to housing 12. Junction box 26 includes a connector board 28 having connectors 30 and 32 which are configured

to connect junction box 26 to an instrument panel main wiring harness 34 through conductor assemblies 36 and 38.

[0018] Center stack housing 12 includes a conductor assembly 40 molded into rear wall 18. Conductor assembly 40 can be any known wiring assembly such as an insulated flat wire assembly, an insulated ribbon wire assembly having a plurality of individual wires, and insulated single wire assemblies. Conductor assembly 40 includes pigtails 42, 44, 46, 48, 50, 52, 54, 56, and 58. Pigtails 42-58 extend from conductor assembly to a position outside rear wall 18. An electrical connector 60 is attached to each pigtail 42-58. Electrical connectors 60 are configured to connect to the various vehicle systems and controls, for example, audio system 22 and heating and air conditioning controls 24. Conductor assembly 40 is connected to main wiring harness 34 through junction box connector board 28. Particularly, conductor assembly 40 is electrically connected to an integrated connector 62 (shown in Figure 3) in housing rear wall 18. A connector 64 located on junction box connector board 28 connects to integrated connector 62.

[0019] Referring also to Figures 2, junction box 26 includes an extension portion 66 of housing side wall 14 sized to receive connector board 28. Extension portion 66 defines a junction box housing 67 that is integrally molded into housing side wall 14. A junction box cover 68 couples to side wall extension portion 64 to close junction box 26. In other embodiments, junction box 26 is not integrally molded into housing 12 but is a separate element attached to housing 12 by any suitable method, for example fasteners and adhesive bonding.

[0020] Referring to Figure 3, conductor assembly 40 is connected to integrated connector 62 which is integrated into housing back wall 18. Integrated connector 62 can be molded into back wall 18 or snapped into place in an appropriately sized opening in back wall 18. Connector 64 is positioned on connector board 28 to align with integrated connector 62. Conductor assembly 36 includes a connector 70 sized and shaped to connect with connector 30 on connector board 28.

[0021] Figure 4 is a rear perspective view of a center stack housing 72 in accordance with another exemplary embodiment. Housing 72 includes a rear wall 74 and side walls 76 and 78. A conductor assembly 80 is connected at a first end 82 to an integrated connector 84. Connector assembly 80 is molded into housing 72 and extends through rear wall 74 and side wall 76. Conductor assembly 80 includes pigtails 86, 88, 90, and 92 which extend through housing 72 to a position outside housing 72. Connectors 94, 96, 98, and 100 are attached to pigtails 86, 88, 90, and 92 respectively. Connectors 94, 96, 98, and 100 are sized to connect to housing rear wall 74. Specifically, connectors 94, 96, 98, and 100 are sized to be received in connector openings 102, 104, 106, and 108 in housing rear wall 74. Connectors 94, 96, 98, and 100 include notches 110 sized to receive housing rear wall 74 to hold connectors 94, 96, 98, and 100 in place in connector openings 102, 104, 106, and 108 respectively.

[0022] Referring to Figures 5-7, in one exemplary embodiment, thermoplastic center stack housing 12, described above, is formed by injection molding using a suitable mold 112 that is configured to produce a desired shape of center stack housing 12. Figures 5 and 6 show mold 112 in an open position while Figure 7 shows mold 112 in a closed position. Mold 112 includes a first mold member 114 and a second mold member 116. First mold member 114 is sized and configured to mate with second mold member 116 forming a cavity 117 that receives the thermoplastic materials used to form center stack housing 12.

[0023] Conductor assembly 40 is positioned in mold 112 with a portion of conductor 40 extending outside the cavity of mold 112 when in the closed position. Mold 112 includes positioning rolls 118 and 120 located on outer surfaces 122 and 124 of first mold member 114 respectively. First mold member 114 includes positioning tabs 126 and 128 extending from an inner surface 130, and second mold member 116 includes mating positioning members 132 and 134 extending from inner surface 136. Positioning tabs 126, 128, 132, and 134 hold conductor 40 in place inside mold 112 during the molding process. In this exemplary embodiment, first mold member also includes positioning tabs 138 and 140 extending from inner surface 130. A mating depression 142 in second mold member 116 receives conductor 40.

The action of positioning tabs 138 and 140 and mating depression 142 positions conductor 40 along inner surface 136, and conductor 40 will be protruding through housing 12 after molding.

[0024] After mold 112 is closed, the predetermined thermoplastic material is injected into mold cavity 117 through an injection port 144 to form center stack housing 12. Mold 112 is then opened and center stack housing 12 is removed. The appropriate connectors are attached to conductor 40, and junction box connector board 28 is coupled to housing 12 and connected to integrated connector 62.

[0025] The above described thermoplastic center stack assembly 10 having a thermoplastic housing 12 with at least one molded-in conductor 40 and integral junction box reduces the amount of wiring in an instrument panel assembly. Further, because of the reduced amount of wiring and parts, assembly time is reduced, lowering production costs.

[0026] While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the claims.

## WHAT IS CLAIMED IS:

1. A center stack (10) for an automobile instrument panel assembly, said center stack comprising:

a thermoplastic housing (12) comprising at least one wall (14, 16, 18);

and

at least one conductor assembly (40) molded into at least one wall of said housing.

2. A center stack (10) in accordance with Claim 1 wherein said at least one conductor assembly (40) extends longitudinally through said at least one housing wall (14, 16, 18).

3. A center stack (10) in accordance with Claim 1 wherein each said conductor assembly (40) comprises a first end portion and a second end portion.

4. A center stack (10) in accordance with Claim 3 further comprising connectors (60) coupled to said first end and said second end of said conductor assembly (40).

5. A center stack (10) in accordance with Claim 4 wherein said connector (60) coupled to said first end of said conductor assembly (40) is located at least partially in said at least one wall of said housing.

6. A center stack (10) in accordance with Claim 5 wherein said connector (60) coupled to said first end of said conductor assembly (40) is molded into said at least one housing wall (14, 16, 18).

7. A center stack (10) in accordance with Claim 3 wherein said conductor assembly (40) comprises a plurality of pigtails (42-58) configured so that said conductor assembly comprises at least one first end portion and a plurality of second end portions with each second end portion comprising one pigtail.



8. A center stack (10) in accordance with Claim 7 wherein each said pigtail (42-58) coupled to a connector (60).

9. A center stack (10) in accordance with Claim 8 wherein said housing (12) further comprises at least one connector opening (102-108), each said connector opening sized to receive a connector (60).

10. A center stack (10) in accordance with Claim 1 further comprising a junction box (26) coupled to said at least one connector assembly (40), said junction box configured to couple to a main instrument panel wiring harness (34).

11. A center stack (10) in accordance with Claim 1 further comprising a junction box housing (67) molded into one of said at least one wall (14, 16, 18) of said center stack housing (12).

12. A center stack (10) in accordance with Claim 11 further comprising a connector board (28) sized to fit in said junction box housing (67).

13. A center stack (10) in accordance with Claim 11 further comprising a junction box cover (68) coupled to said junction box housing (67).

14. A center stack (10) for an automobile instrument panel assembly, said center stack comprising:

a housing (12) comprising at least one wall (14, 16, 18); and

a junction box housing (67) molded into one of said at least one wall of said center stack housing.

15. A center stack (10) in accordance with Claim 14 further comprising a connector board (28) sized to fit in said junction box housing (67).

16. A center stack (10) in accordance with Claim 14 further comprising a junction box cover (68) coupled to said junction box housing (67).

17. A center stack (10) in accordance with Claim 14 further comprising at least one conductor assembly (40) molded into at least one wall (14, 16, 18), said at least one conductor assembly extending longitudinally through said at least one wall.

18. A center stack (10) in accordance with Claim 17 wherein each said conductor assembly (40) comprises a first end portion and a second end portion.

19. A center stack (10) in accordance with Claim 18 further comprising connectors (60) coupled to said first end and said second end of said conductor assembly (40).

20. A center stack (10) in accordance with Claim 17 wherein said conductor assembly (40) comprises a plurality of pigtails (42-58) configured so that said conductor assembly comprises at least one first end portion and a plurality of second end portions with each second end portion comprising one pigtail, each said pigtail coupled to a connector (60).

21. A center stack (10) in accordance with Claim 17 further comprising at least one connector opening (102-108), each said connector opening sized to receive a connector (60) coupled to said at least one conductor assembly (40).

22. A method of producing a center stack (10) for an instrument panel, the center stack comprising a housing (12) having at least one wall (14, 16, 18), said method comprising:

providing a mold (112);

positioning at least one conductor assembly (40) at least partially in the mold; and

charging the mold with thermoplastic material to mold the center stack.

23. A method in accordance with Claim 22 wherein the mold (112) comprises a plurality of positioning tabs (126, 128) to align each conductor assembly (40) inside the mold.

24. A method in accordance with Claim 23 wherein at least one of the plurality of positioning tabs (126, 128) are located in the mold to position a side surface of a conductor assembly (40) so that the side surface is visible in the housing wall (14, 16, 18).

25. A method in accordance with Claim 22 wherein at least one conductor assembly (40) comprises a plurality of pigtailed (42-58) configured so that the conductor assembly comprises at least one first end portion and a plurality of second end portions with each second end portion comprising one pigtail, and positioning at least one conductor assembly at least partially in the mold (112) comprises positioning at least one conductor assembly in the mold so that a portion of each pigtail is located outside the mold.

26. A method in accordance with Claim 22 wherein one wall (14, 16, 18) of the center stack housing (12) comprises a junction box housing (67).

27. A method in accordance with Claim 22 further comprising:  
removing the center stack (10) from the mold (112); and  
coupling an electrical connector (60) to each conductor assembly (40) end portion.

28. An automobile instrument panel center stack (10) kit comprising:

a molded thermoplastic housing (12) comprising at least one wall (14, 16, 18);

a junction box housing (67) molded into one of said at least one wall of said housing; and

a connector board (28) sized to fit in said junction box housing.

29. A kit in accordance with Claim 28 wherein said housing (12) further comprises at least one conductor assembly (40) molded into at least one wall (14, 16, 18), said at least one conductor assembly extending longitudinally through said at least one wall.

30. A kit in accordance with Claim 28 wherein said housing (12) further comprises connectors (60) coupled to a first end and a second end of said conductor assembly (40).

31. A kit in accordance with Claim 30 wherein said connector (60) coupled to said first end of said conductor assembly (40) is located at least partially in said at least one wall (14, 16, 18) of said housing (12).

32. A kit in accordance with Claim 30 wherein said connector (60) coupled to said first end of said conductor assembly (40) is molded into said at least one wall (14, 16, 18) of said housing (12).

33. A kit in accordance with Claim 28 further comprising at least one automobile system control (24) sized to be at least partially received in said housing (12).

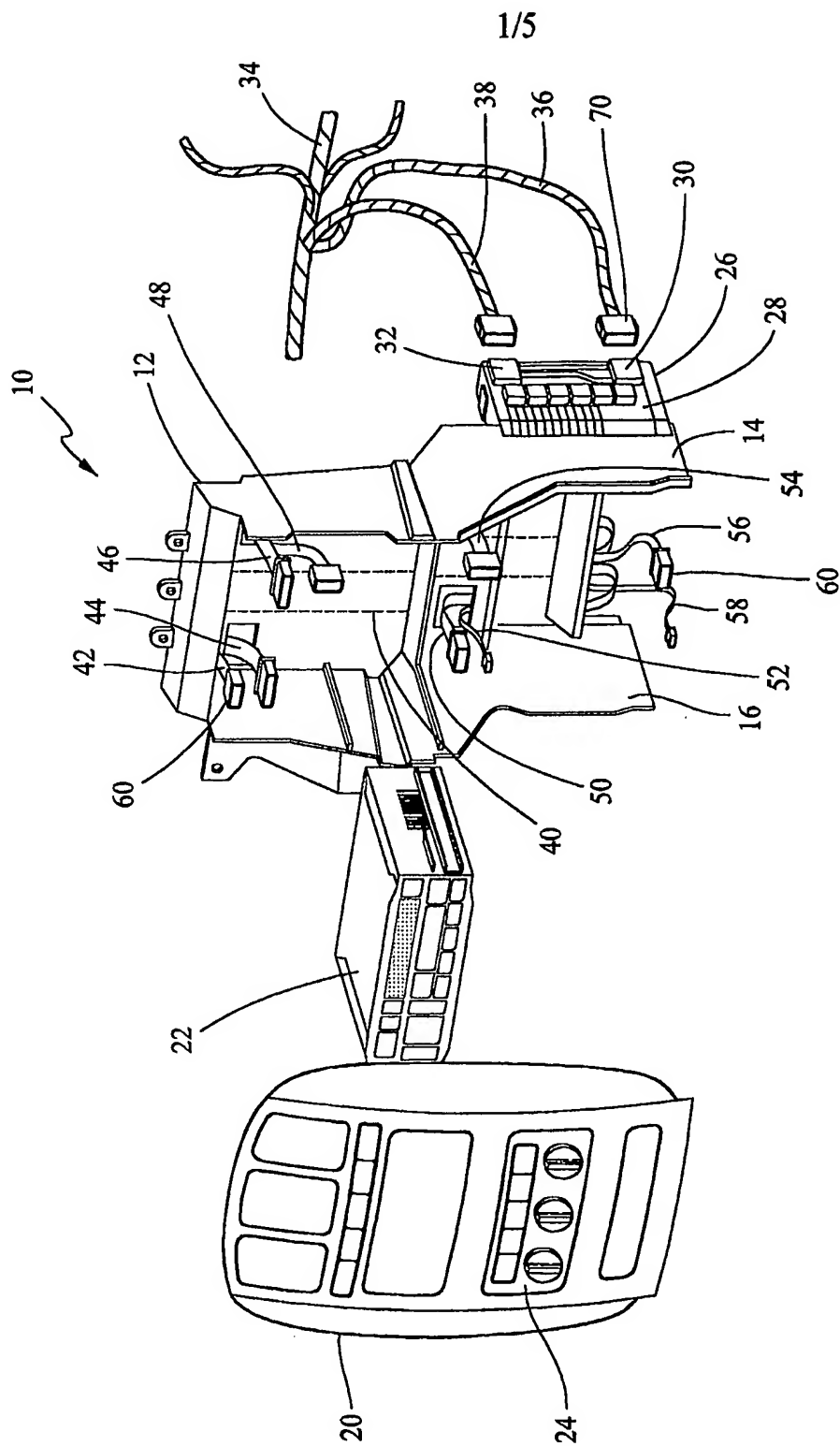


FIG. 1

2/5

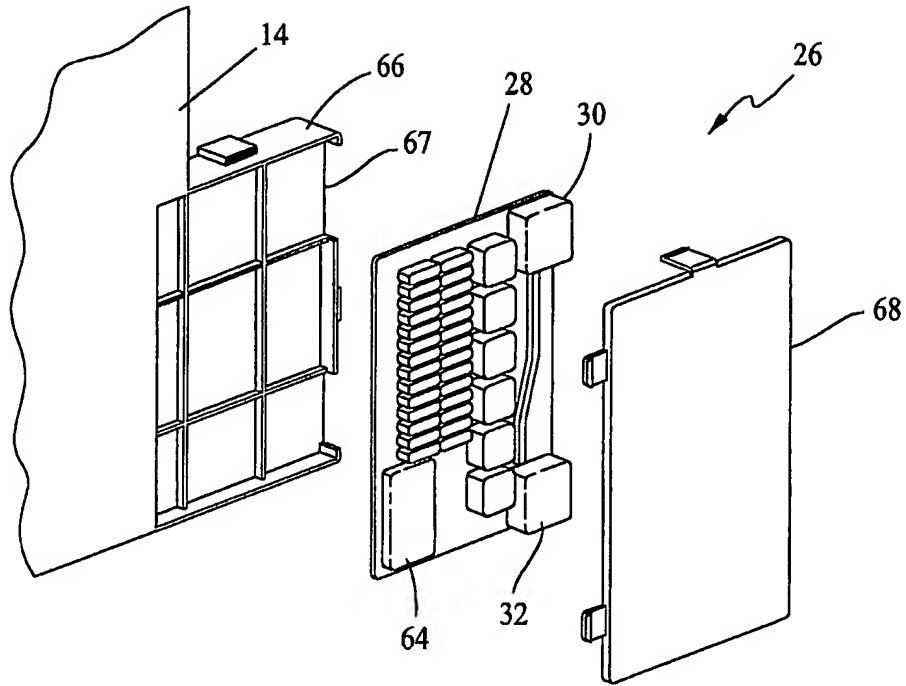


FIG. 2

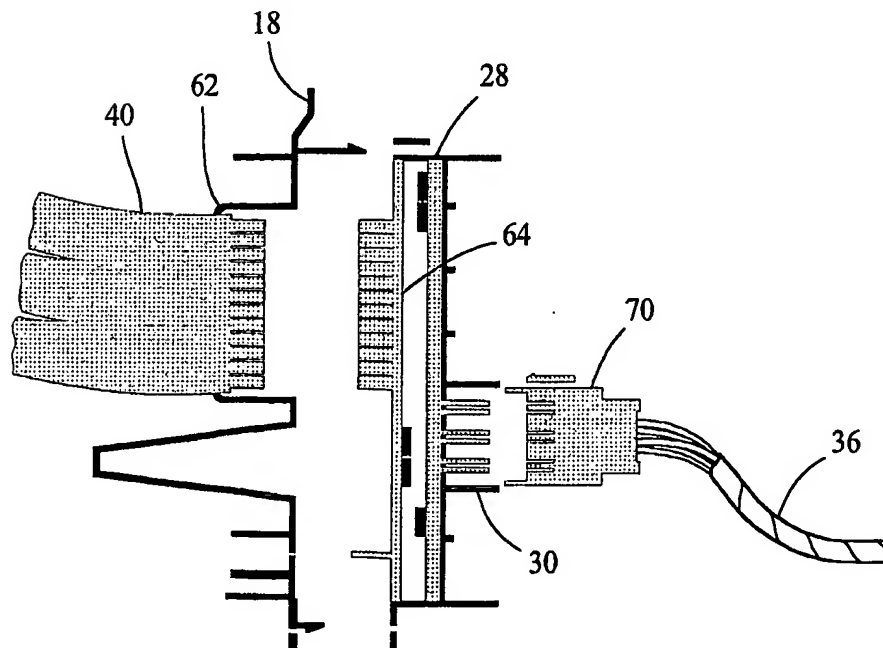


FIG. 3

3/5

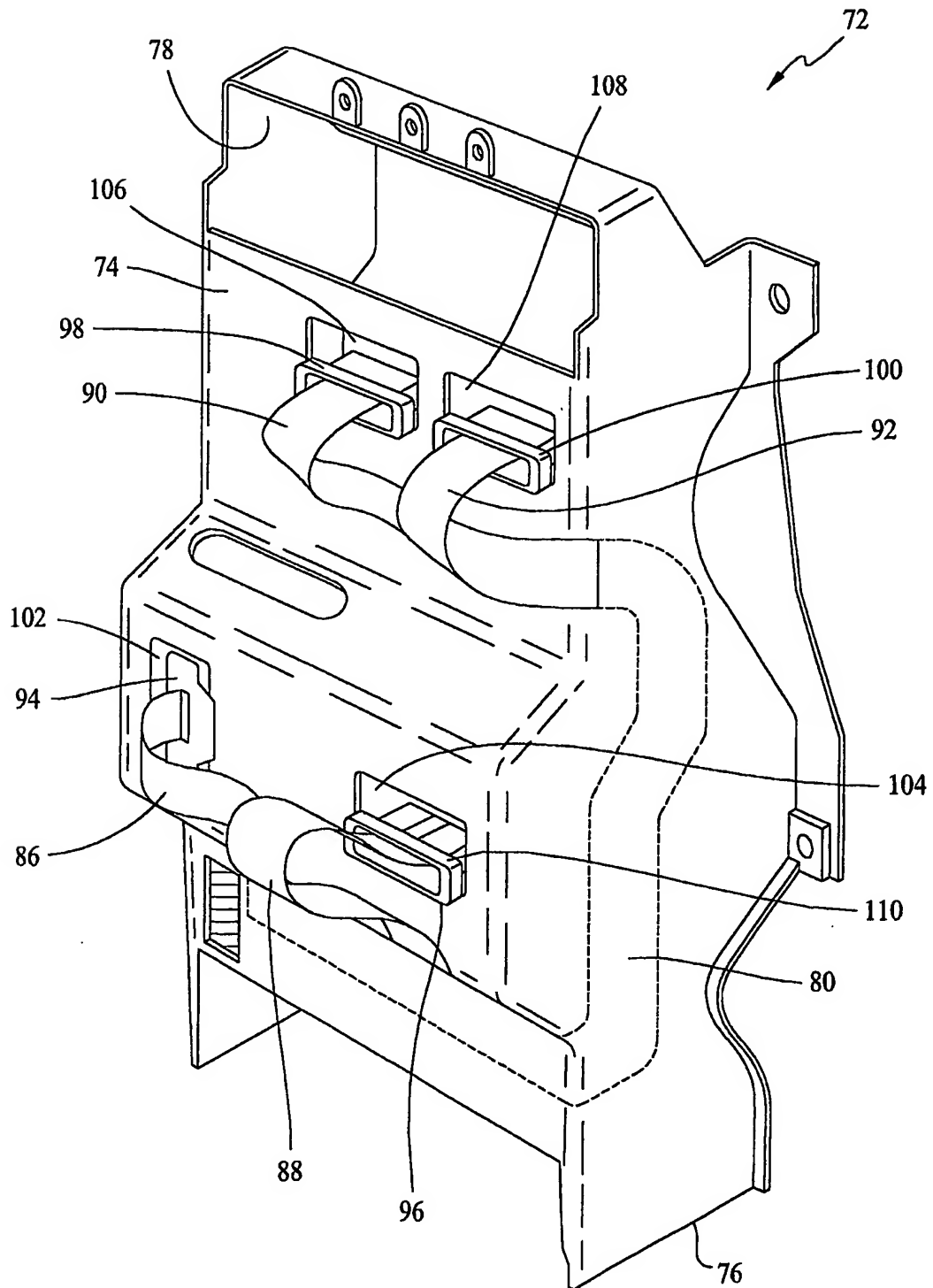


FIG. 4

4/5

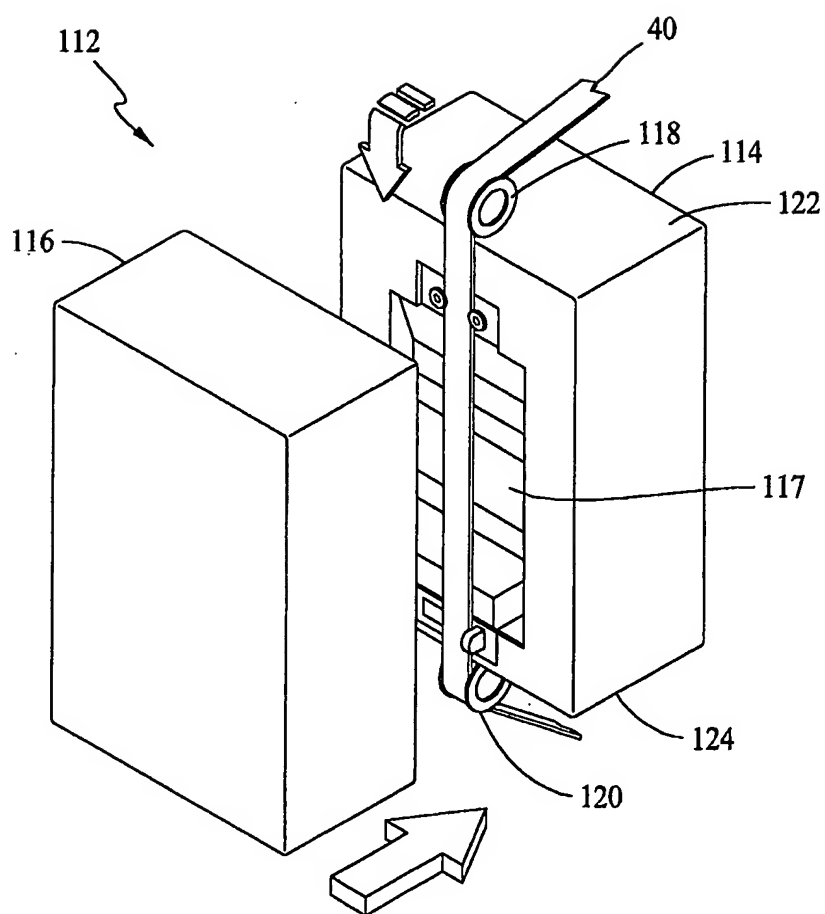


FIG. 5



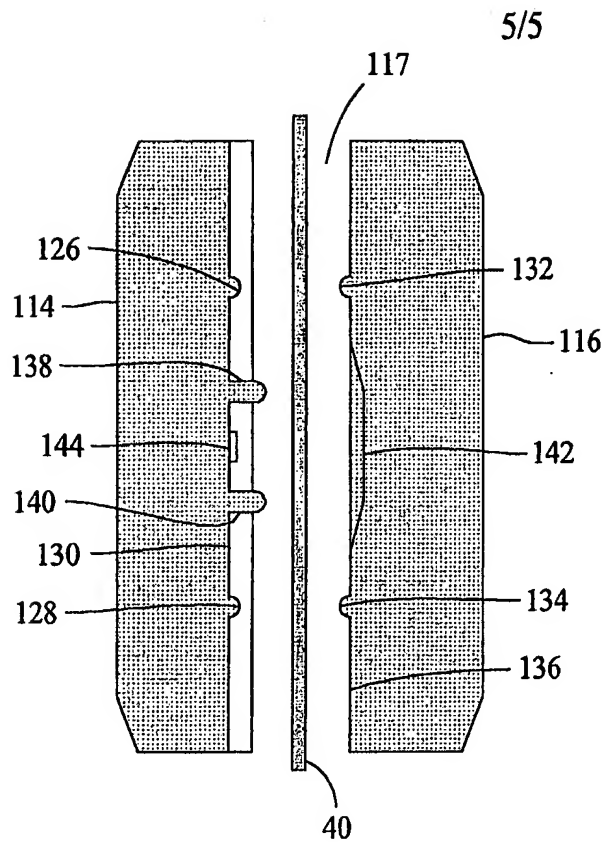
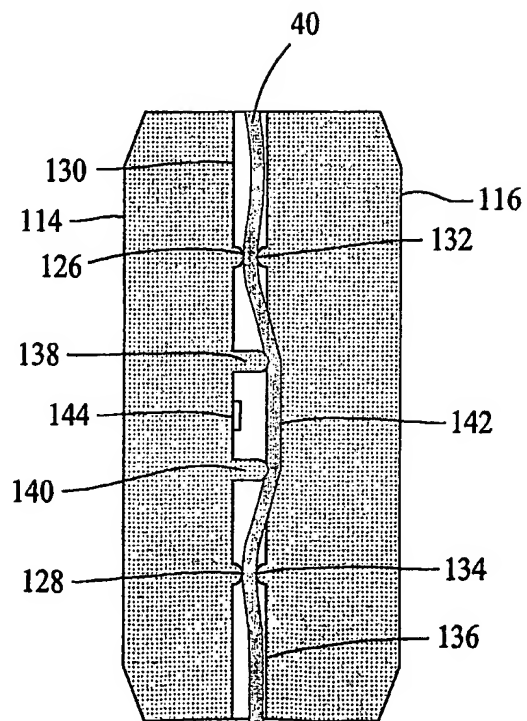


FIG. 7



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/01159

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01R 11/30

US CL : 439/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 439/34, 67, 280; 174/72A

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EPO, JPO

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,062,888 A (TAKIGUCHI) 16 May 2000 (16.05.2000), see entire document.	1-33
Y	US 5,382,169 A (BAILEY et al) 17 January 1995 (17.01.1995), Abstract; col. 4, lines 56-58; Fig. 14.	1-33
Y	US 5,805,402 A (MAUE et al) 08 September 1998 (08.09.1998), see entire document.	10-13
Y	US 6,120,327 A (O'BRIEN et al) 19 September 2000 (19.09.2000), see entire document.	22-27
Y	US 6,250,706 B1 (DAVIS, JR. et al) 26 June 2001 (26.06.2001), see entire document.	7, 8, 20

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

16 April 2002 (16.04.2002)

Date of mailing of the international search report

13 MAY 2002

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